

Laser-Induced Emissions Sensor for Soot Mass in Rocket Plumes, Phase I

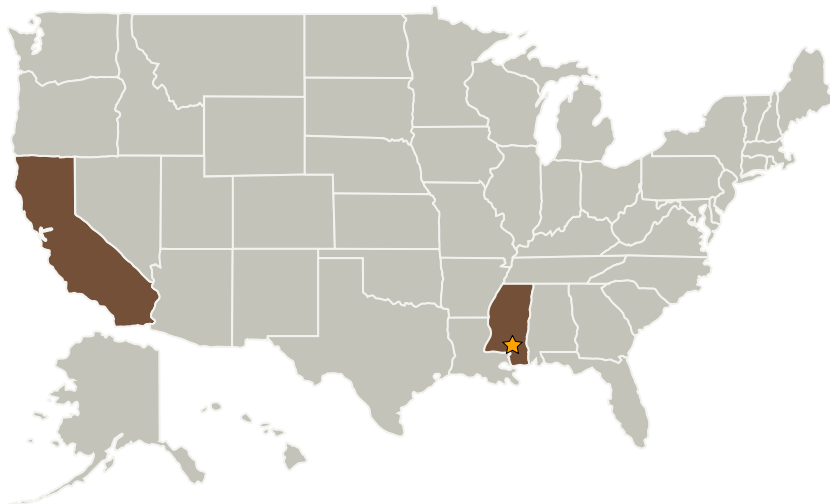
Completed Technology Project (2006 - 2006)



Project Introduction

A method is proposed to measure soot mass concentration non-intrusively from a distance in a rocket engine exhaust stream during ground tests using laser-induced incandescence (LII). The basic technique has already been proven in an aircraft engine exhaust, and should be adaptable to a rocket plume with some modifications, including a correction scheme to account for the high plume temperatures, and proper isolation from acoustic vibrations. Besides enabling the technique to be applied to a rocket engine, the required modifications should also lead to potential opportunities to measure temperature and additional species, including polycyclic aromatic hydrocarbons (PAHs) and trace metals introduced into the exhaust through wear, such as Ni, Fe and Cr. A multi-parameter sensor is envisioned that combines four techniques, all using the same hardware: LII to measure soot mass concentration, laser-induced fluorescence to measure PAHs, laser-induced breakdown spectroscopy to measure trace metals, and passive emission to measure temperature. The sensor will employ a line-imaging near-backscatter design, used successfully in our previous work, that allows spatially-resolved measurements of all parameters along a path through the plume from a single vantage point, located a safe distance from the plume. This system should provide continuous, rapid, in situ measurements in a difficult measurement environment.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi
MetroLaser, Inc.	Supporting Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Laguna Hills, California

Primary U.S. Work Locations

California	Mississippi
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.5 Propulsion Flowpath and Interactions